REMARKS

Claims 1-2 and 5-9 are pending in the present application

Applicants respectfully request entry of the foregoing and reconsideration of the presently claimed invention in view of the following remarks.

The rejections of: (a) Claims 1, 2, and 5-8 are rejected under 35 U.S.C. § 103(a) over Yano (U.S. 5,801,105) in view of Tarui (U.S. 5,674,563); (b) Claims 1, 2, and 5-8 are rejected under 35 U.S.C. § 103(a) over Yano '394 (JP 10-017394, based on an English computer translation and an English abstract of Yano '394) in view of Tarui; (c) Claims 1, 2, and 5-8 are rejected under 35 U.S.C. § 103(a) over Yano '394 (where U.S. 6,121,647 is used as an "accurate translation" of Yano '394) in view of Tarui; and (d) Claim 9 under 35 U.S.C. § 103(a) over Yano or Yano '394 (where U.S. 6,121,647 is used as an accurate translation of Yano '394) or Yano '394) (based on an English computer translation and an English abstract of Yano-394) in view of Tarui and further in view of Moon (U.S. 5,744,374) or Nashimoto (U.S. 5,834,803), are obviated by the present amendment.

The present invention provides a multilayer thin film formed on an Si substrate by epitaxial growth, the multilayer thin film comprising:

a buffer layer formed on said Si substrate, where said buffer layer includes

an oxide thin film of zirconium or of a rare earth element on said Si substrate;

a first perovskite oxide thin film on said oxide thin film; and

an electrically conductive thin film *having (100) or (001) orientation* on said first perovskite oxide thin film,

a second perovskite oxide thin film formed on said buffer layer, *which is grown epitaxially with respect to said buffer layer*, where said second perovskite oxide thin film comprises $PbTiO_3$ and has a (100) or (001) orientation, and

a ferroelectric thin film, which has a different composition than the second perovskite oxide thin film and which is epitaxially grown on said second perovskite oxide thin film (see Claim 1, *emphasis added*).

Applicants submit that no prior art reference of record, individually or collectively, discloses the specific combination of recited elements in Claim 1. In particular, the art of record is silent in regard to the orientation of the electrically conductive thin film and the epitaxial film. As such, Applicants submit that the claimed invention is not obvious in view of the art of record.

The cited prior art discloses multilayers of a ferroelectric film grown directly on a buffer layer of $Pt/BaTiO_3/ZrO_2$ on a Si substrate. In particular, Yano discloses a multilayer film of $BaTiO_3(001)$ / $Pt(001)$ / $BaTiO_3(001)$ / $ZrO_2(001)$ / Si . Yano at column 28, lines 54-55.

The Yano references fail to disclose or suggest "a second perovskite oxide thin film formed on said buffer layer, *which is grown epitaxially with respect to said buffer layer*, where said second perovskite oxide thin film comprises $PbTiO_3$ and has a (100) or (001) orientation." This deficiency in the disclosures of Yano is not compensated for by the disclose of Tarui.

Tarui discloses forming a PZT ferroelectric thin film on a $PbTiO_3$ buffer layer by depositing in oxygen an ordered sequence of layers of Ti or TiO_2; Pb or PbO; and Zr or ZrO_2, and heating the sequence of layers. Tauri at, e.g., column 5, lines 35-67; column 16, lines 37-53. More specifically, Tauri discloses forming a PZT ferroelectric thin film on a Pt substrate

using a $PbTiO_3$ buffer layer to improve the flatness of the PZT ferroelectric thin film. However, Tarui fails to disclose or suggest that the $PbTiO_3$ buffer layer is an *epitaxial* film. The orientation of the second perovskite oxide thin film is important in the present invention and the advantages flowing therefrom would not be expected by the skilled artisan. Specifically, Applicants note that when the second perovskite oxide thin film is an epitaxial film the crystallographic properties of the overlying ferroelectric thin film are enhanced (page 11, lines 24-32).

Further, Moon and Nashimoto do not compensate for the aforementioned deficiency in the Yano disclosures as combined with Tarui.

Accordingly, the limitation "a second perovskite oxide thin film formed on said buffer layer, *which is grown epitaxially with respect to said buffer layer*, where said second perovskite oxide thin film comprises $PbTiO_3$ and has a (100) or (001) orientation" is neither disclosed nor suggested by the combined disclosures as cited in the present rejection. MPEP §2142 states: "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation... to modify the reference... Second, there must be a reasonable expectation of success. Finally, the prior art reference... must teach or suggest all the claim limitations." Therefore, for the foregoing reason, the present invention is not obvious in view of the art of record.

Moreover, the Yano references (taken with Tarui, Moon, and Nashimoto) suffer an additional deficiency. Namely, the combined art of record fails to disclose or suggest "an electrically conductive thin film *having (100) or (001) orientation* on said first perovskite oxide thin film." Yano in particular fails to disclose this limitation as recognized by the Examiner.

As stated above, Tauri discloses forming a PZT ferroelectric thin film on a Pt substrate using a $PbTiO_3$ buffer layer to improve the flatness of the PZT ferroelectric thin film. The Examiner asserts that the $PbTiO_3$ buffer layer inherently has a (001) orientation due to the definition of epitaxy. However, Tarui is silent about the orientation of the $PbTiO_3$ and about growing the PZT ferroelectric thin film epitaxially on the $PbTiO_3$ (*supra*). Furthermore, when an Examiner maintains that there is an implicit teaching or suggestion in the prior art, "the Examiner should indicate where (page and line or figure) such a teaching or suggestion appears in the prior art." (*Ex parte* Jones, 62 USPQ2d 1206, 1208 (Bd. Pat. App. & Inter. 2001) (**copy enclosed**). However, in the present application the Examiner has not indicated where, if at all, support may be found in Tarui for the inherent epitaxial orientation of the $PbTiO_3$ buffer layer.

In view of the foregoing, the Yano disclosures in view of Tarui (even when combined with Moon and Nashimoto) fail to suggest the independent Claim 1 features of an electrically conductive thin film *having (100) or (001) orientation* .

For the reasons above, the outstanding obviousness rejections are not believed to be tenable. As such, Applicants request withdrawal of these grounds of rejection.

Applicants submit that the present application is now in condition for allowance. Early notification of such action is earnestly solicited.

Respectfully submitted,

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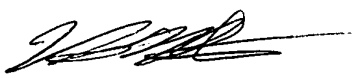

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SUPPORT FOR THE AMENDMENT

Claims 3-4 were previously canceled.

Claim 1 is presently amended.

Support for the amendment of Claim 1 is found in the specification as originally filed at, for example, page 10, lines 16-21 and page 11, lines 24-32.

No new matter is believed to be introduced by the amendments herein.